

A comparison of the measurement properties of the Juvenile Arthritis Functional Assessment Scale with the childhood health assessment questionnaire in daily practice

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Abstract We compared the measurement properties of a performance test (Juvenile Arthritis Functional Assessment Scale; JAFAS) with a questionnaire-based instrument (Childhood Health Assessment Questionnaire; CHAQ) to measure functional ability in patients with juvenile idiopathic arthritis on the level of individual items. In 28 consecutive children visiting an outpatient paediatrics clinic, the JAFAS (range 0–20) and CHAQ (range 0–3) were applied, and measures of disease activity and joint range of motion (ROM) were determined. Twenty-eight children with a median age of 10 years and median disease duration of 3.2 years were included. The median JAFAS score was 0, and the median CHAQ score was 0.125. Cronbach's alpha was 0.92 for the JAFAS and 0.96 for the CHAQ. The Spearman correlation coefficient between the JAFAS and the CHAQ was 0.55 ($P < 0.01$). With six out of

ten items, the JAFAS classified the child as less disabled than with corresponding CHAQ activities. Overall, associations with measures of disease activity and ROM were higher for the CHAQ than for the JAFAS. A performance test (JAFAS) does not appear to have an added benefit over the questionnaire-based assessment (CHAQ) of physical function in a cross-sectional study.

Keywords Activities of daily living · Disability evaluation · Juvenile idiopathic arthritis · Questionnaire

Introduction

In patients with juvenile idiopathic arthritis (JIA), functional disability can both be evaluated by means of questionnaires and observed performance tests. In a previous study [1], the internal consistency, construct validity and responsiveness of a questionnaire-based instrument, the Childhood Health Assessment Questionnaire [2] (CHAQ), proved to be somewhat better than those of an observed performance test, the Juvenile Arthritis Functional Assessment Scale [3] (JAFAS). As performance tests are time consuming and require specific equipment and trained assessors, it is relevant to know whether they have an added benefit over a questionnaire-based instrument.

In the abovementioned, both measures displayed a floor effect [1]. As minor average disability in patients with JIA is nowadays a reality, identifying those tasks that can discriminate among lower levels of disability becomes all the more important. In addition, as performance tests are time consuming and require specific equipment and trained assessors, it is relevant to know whether they have an added benefit over a questionnaire-based instrument.

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The aim of the present study was therefore to compare the measurement properties of the JAFAS and the CHAQ in an unselected population of children with JIA on the level of individual items.

Materials and methods

Study design and patient recruitment

Between January 2001 and April 2002, 34 consecutive children with JIA were recruited according to the following criteria: age between 7 and 12 years, diagnosis JIA [4] and no other medical conditions interfering with functional ability. The patients were visiting the outpatient paediatric rheumatology clinic of the Leiden University Medical Centre. The clinic, which has two part-time working paediatric rheumatologists, is a tertiary referral centre for children with rheumatic diseases from the Leiden district and surrounding area (1 million inhabitants). The Medical Ethics Committee approved the study, and all patients and their parents gave written informed consent.

Assessment methods

The JAFAS (range 0–20) was developed as an objective measure of functional ability in children with rheumatic diseases between 7 and 18 years. With the JAFAS, the observed time needed to perform ten activities is compared with a standard ‘criterion’ time. The JAFAS was administered by one well-trained paediatric physical therapist (Bekkering).

The CHAQ, including 30 activities in eight different domains, with a total score ranging from 0 (no limitation) to 3 (maximal limitation), was completed by interviewing the children.

Disease activity was measured by the erythrocyte sedimentation range (ESR) and joint counts on swollen (JC-swollen) or tender joints (JC-tender), concerning 28 joints included in the Fuchs score [5] plus the ankles (range 0–30). The feeling of well-being and the presence of pain were determined by 15-cm Visual Analogue Scales (VAS), with anchors of ‘no pain/no discomfort’ on the left and ‘very severe pain/severe discomfort’ on the right (pain-VAS and VAS-well-being; final scores converted to scores ranged from 0 to 3). A similar VAS was used for the physician’s evaluation of disease activity (VAS-paediatrician; score range 0–3). Limitation in range of motion (ROM) was determined by a joint count on in motion-restricted joints (JC-limitation; range 0–30) and the paediatric Escola de Paulista de Medicina ROM scale [6] (pEPM-ROM; score range 0–6).

Statistical analysis

The ten JAFAS items were linked with nine corresponding CHAQ items (CHAQ-9). All ten items had a counterpart in the CHAQ; however, the JAFAS items ‘get in’ and ‘get out of bed’ matched only one item in the CHAQ (get in and out of the bed). Associations between the JAFAS, the CHAQ-total and CHAQ-9 scores were determined by means of Spearman correlation coefficients (r_s). To test the concordance between individual JAFAS and CHAQ-9 items, the score on every item was dichotomised into not limited (0) or limited (≥ 1) and mutually compared with Cohen’s Kappa (κ value greater than 0.80 is considered as good) [7]. Internal reliability of the JAFAS, CHAQ-total and CHAQ-9 was determined by calculating Cronbach’s α (α value of 0.85 is considered good) [8] and item–total correlations. In addition, Spearman correlation coefficients of the JAFAS, CHAQ-total and CHAQ-9 scores with measures of disease activity and ROM were computed.

Results

Characteristics of the patients

From the 33 eligible children who visited the outpatient paediatric rheumatology clinic in the study period, two children refused to participate, and three did not fulfil the inclusion criteria (two children had serious mental retardation and one child had the attention deficit hyperactivity disorder). Thus, 28 children, 12 boys and 16 girls, were included. Their median age was 10.0 years (range 7.3–12.8), and the median disease duration was 3.3 years (range 0.1–10.2). A majority of the children had a polyarticular (nine patients) or oligoarticular pattern (11 patients) of joint involvement. Systemic onset JIA (three patients), arthritis and psoriasis (four patients) and enthesitis type JIA (one patient) were less frequently seen. Twenty (71%) children used anti-rheumatic medication, of whom 17 (68%) used disease-modifying anti-rheumatic drugs and three (11%) used oral corticosteroids.

The median scores of the ESR (7.7 mm/h, range 2–54), the JC-swollen (1.0, range 0–28), the JC-tender (0.8, range 0–8), the VAS-well-being (0.2, range 0–2.5), VAS-pain (0.1, range 0–1.5) and VAS-paediatrician (0.2, range 0–2.7) point at a relatively low level of disease activity. With respect to joint ROM, the median JC-limitation score was 1.0 (range 0–17), and the median EPM-ROM score was 0.5 (range 0–19.5).

The median scores of the JAFAS (0, range 0–13) and CHAQ (0.125, range 0–2.6) indicate, on average, the presence of no and very little functional disability,

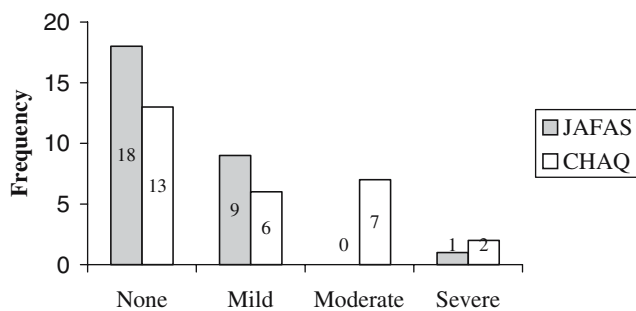


Fig. 1 Frequencies of JAFAS and CHAQ scores. No disability JAFAS=0, CHAQ=0. Mild disability JAFAS=1–3, CHAQ=0–0.5. Moderate disability JAFAS=4–9, CHAQ=0.6–1.5. Severe disability JAFAS=10–20, CHAQ=1.6–3.0

respectively. The frequency distributions (Fig. 1) of the JAFAS and the CHAQ show that according to the JAFAS, 18 out of 28 patients (65%) had no limitations, whereas according to the CHAQ, 13 out of 28 patients (47%) had no functional disability.

Reliability and validity

With respect to internal reliability, Cronbach's α was 0.91 for the JAFAS, 0.96 for the CHAQ-total score and 0.92 for the CHAQ-9. The item-total correlation was moderate (≥ 0.60 ; $p < 0.01$) for two out of ten JAFAS and six out of

Table 1 JAFAS and CHAQ scores and their associations (Spearman correlation coefficients) in 28 patients with JIA

Item	JAFAS	Number of patients limited in activity	Internal reliability, item-total correlation	CHAQ	Number of patients limited in activity	Internal reliability, item-total correlation	Concordance among JAFAS and CHAQ items		
							Number of concordant pairs	CHAQ / JAFAS ^b	Cohen's κ
1	Button shirt/blouse	9	0.85**	Dress, including tying shoelaces and doing buttons	7	0.76**	20	3/5	0.30 ns
2	Pull shirt or sweater over head	1	0.38*	Pull on sweater over head	1	0.34 ns	28	0/0	1.00**
3	Pull on both socks	2	0.49**	Pull on socks	7	0.64**	21	6/1	0.13 ns
4	Cut food with knife and fork	4	0.70**	Cutting meat	7	0.79**	21	5/2	0.23 ns
5	Get into bed	0	0.00	Getting in and out of bed	3	0.47*	24	4/0	^a
6	Get out of bed	0	0.00				24	4/0	^a
7	Pick something up off floor from standing position	1	0.38*	Bend down to pick up clothing or a piece of paper	5	0.62**	24	4/0	0.29*
8	From standing position sit on floor, then stand up	2	0.52**	Stand up from a low chair or floor	2	0.51**	28	0/0	1.00**
9	Walk 50 feet without assistance	1	0.38*	Walk outdoors on flat ground	5	0.67**	24	4/0	0.29*
10	Walk up flight of 5 steps	1	0.38*	Climb up five steps	7	0.69**	22	6/0	0.20 ns
Total scores			Cronbach's α			Cronbach's α	Spearman's r		
	10 JAFAS items	14	0.91	9 CHAQ items total CHAQ score	18	0.92	0.56**		
					18	0.96	0.55**		

* $p < 0.05$, ** $p < 0.01$

^a No statistics are computed because of a constant factor

^b Number of pairs with CHAQ ≥ 1 and JAFAS = 0 / Number of pairs with JAFAS ≥ 1 and CHAQ = 0

nine matching CHAQ tasks. Besides these six items (dressing, pull on socks, cutting meat, bend down, walk outdoors and climb stairs) selected in this study, the items reach for object, writing, turn door key or water tab, and running were frequently scored as difficult and showed good item–total correlations.

Concerning the agreement between the two instruments, the JAFAS total score correlated moderately well with both the CHAQ-total score ($r=0.55$, $p<0.01$) and the computed score of the corresponding CHAQ-9 items ($r=0.56$, $p<0.01$). On the individual item level, there was excellent agreement [7] ($\kappa>0.80$) with respect to tasks 2 (pull shirt or sweater over head) and 8 (from standing position sit on floor, then stand up). The results of the internal reliability statistics and the associations between the total scores and the corresponding item scores of JAFAS and CHAQ are presented in Table 1.

Construct validity

The relationship between the JAFAS, CHAQ, CHAQ-9 and measures of disease activity, pain, swelling and limited range of joint motion are shown in Table 2. Both the JAFAS and the CHAQ scores correlated moderately to well with the VAS-paediatrician, JC-swollen, JC-limited joints, pEPM-ROM and CHAQ-pain. Neither the JAFAS nor the CHAQ scores were significantly associated with the JC-tender. The CHAQ showed significant associations with the ESR and CHAQ well-being, whereas the JAFAS did not.

Discussion

In parallel with an earlier publication [1], this study demonstrated no advantages of a performance test (JAFAS) as opposed to a questionnaire (CHAQ) to measure functional disability in children with JIA. We found modest correlations between the two instruments and the floor

effect with the CHAQ being smaller than with the JAFAS. Moreover, the CHAQ showed a better internal reliability and stronger associations with measures of disease activity and joint ROM than the JAFAS. Tennant et al. [1] reported similar results regarding the internal reliability and validity, in addition to a smaller responsiveness of the JAFAS.

Possible explanations for the discrepancy between the JAFAS and CHAQ are that the JAFAS is concerned with performance on one specific time point and the speed of performance, whereas the CHAQ refers to the last week and the experience of difficulties, including the need for aids, appliances or other persons. Discordance between observed and reported functional disability has been reported earlier in both children with JIA [9] as well in adults with rheumatoid arthritis [10].

The relatively small number of patients and the lack of distribution of the scores over the full ranges of the various outcome measures could limit the external validity of this study. However, the observed low level of functional disability is consistent with results of previous studies in paediatric rheumatology [11].

The children's version of the CHAQ was originally designed and validated with the questionnaire self-administrated by the patients. In this study, the questions were read out and filled in by the investigator to ensure appropriate completion. Although it is likely that with this method, the same results are obtained as with self-administration, a possible influence on the final scoring cannot be totally ruled out.

Given the large improvements in medical treatment of JIA and considering the persisting need for valid and responsive measures in clinical trials, a further elaboration of the tasks included in measures of functional ability, reflecting relevant activities in daily life, is needed. Lam et al. [12] showed that by utilizing new response scales as well as adding more challenging questions than those posed by the original Health Assessment Questionnaire (HAQ), the floor effect could be reduced and the sensitivity enhanced. In addition, the excellent internal reliability of the CHAQ-9 score as found in the present study and the observation that some JAFAS and selected CHAQ items were not or only marginally contributing to the final scores suggest that with both instruments, there are opportunities for a reduction in the number of items, in parallel with the recently developed short version of the HAQ in adult rheumatoid arthritis patients [13]. Which items should be included has to be further examined, as the nine CHAQ items this study focusses on are only selected because they corresponded with the JAFAS. With any future research, the conduction of large, prospective follow-up studies is to be advised.

Competing interests The authors declare that they have no competing interests.

Table 2 Spearman correlation coefficients between JAFAS, CHAQ and other measures in 28 patients

	JAFAS	CHAQ	CHAQ (9 items)
VAS-paediatrician	0.41*	0.56**	0.34 ns
ESR	0.37 ns	0.62*	0.75**
Joint count on swollen joints	0.47*	0.65**	0.48*
Joint count on tender joints	0.07 ns	0.41*	0.09 ns
Joint count on limited joints	0.44*	0.64**	0.59**
Paediatric EPM-ROM	0.50**	0.73**	0.88**
CHAQ-pain	0.38*	0.69**	0.55**
CHAQ-well-being	0.20 ns	0.44*	0.48*

* $p<0.05$, ** $p<0.01$

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